

MILLER CONSTRUCTION, INC.

P.O. BOX 86 ASCUTNEY BLVD WINDSOR, VERMONT 05089-0086
TELEPHONE (802) 674-5525 / FAX (802) 674-5245

TRANSMITTAL

TO: Kristin M. Higgins, PE Project Manager Vermont Agency of Transportation	DATE 7/1/2014	PROJECT NO. Barnard ER BRF 0241 (39)
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XX

WE ENCLOSE THE FOLLOWING:

UNDER SEPARATE COVER WE ARE SENDING THE FOLLOWING

CODE:

A FOR INITIAL APPROVAL

H FOR APPROVAL

B FOR FINAL APPROVAL

I AS REQUESTED OR REQUIRED

C APPROVED AS NOTED-RESUBMISSION REQUIRED

J FOR USE IN ERECTION

D APPROVED AS NOTED-RESUBMISSION NOT REQUIRED

K LETTER FOLLOWS

E DISAPPROVED-RESUBMIT

L FOR FIELD CHECK

E QUOTATION REQUESTED

M FOR YOUR USE

G APPROVED

BY-

Paul Johnson

June 30, 2014
File No. 0171821.00-C, PC



249 Vanderbilt Avenue
Norwood
Massachusetts
02062
781-278-3700
FAX 781-278-5701
<http://www.gza.com>

Mr. Paul Holloway
Miller Construction, Inc.
P.O. Box 86
Windsor, Vermont 05089

Re: Dynamic Pile Test Results
Barnard ER BRF 0241(39)
Barnard, Vermont

Dear Mr. Holloway:

This letter summarizes the results of dynamic pile testing performed by GZA GeoEnvironmental, Inc. (GZA) at the above referenced site on June 27, 2014. The dynamic pile testing was performed in general accordance with the project specifications and ASTM Method Designation D4945-08, "Standard Test Method for High-Strain Testing of Piles" to measure driving stresses in the test pile, evaluate hammer performance, and verify the driving criterion determined by the WEAP analyses.

TEST PILES

Testing was performed on two (2) HP12x74 Grade 50 steel piles located within the Abutment 1 substructure. The required nominal resistance of 402 kips is based upon dividing the maximum factored load of 261 kips by a performance factor of 0.65. The allowable driving stress for Grade 50 steel is 45 ksi (i.e. $0.9f_y$).

HAMMER

The test piles were impacted driven with the Delmag D16-32 single acting diesel hammer having a ram weight of 3,520 lbs. and a maximum rated stroke of 11.4 feet, yielding a maximum rated energy of 40,198 foot-lbs. The Delmag D16-32 is equipped with a ratchet style fuel pump with four settings. The fuel pump settings are designed to limit the ram stroke to 5.3 feet, 7.5 feet, 10.0 feet, and 11.4 feet (open) yielding rated energies of 18,646 ft-lbs., 26,400 ft-lbs., 35,200 ft-lbs., and 40,198 ft-lbs, respectively. The Delmag D16-32 installed test piles while operating on fuel setting 3 (rated 10.0 foot ram stroke) to limit driving stresses.

The PDA was used to make dynamic force and acceleration measurements of the tested piles. These measurements were evaluated in the field to determine pile capacity, pile stress and hammer performance. PDA summary sheets and plots of select averaged PDA parameters versus depth or blow number are attached and summarized in Table 1.



DYNAMIC PILE TEST RESULTS

Abutment 1 Pile 1

Abutment 1 Pile 1 developed a “Case Method” pile capacity of 680 kips at a subgrade pile penetration of 12.1 feet (tip elevation +863.9 feet) and a reported pile penetration resistance of 91 blows per foot and 9 blows per inch for the final thirteen inches of pile penetration with the Delmag D30-32 operating on fuel setting 3 (rated 10.0 foot ram stroke) and providing an 8.8 foot ram stroke. Subsequent CAPWAP analyses performed on the dynamic test data from the end of initial drive indicated an ultimate pile capacity of 660 kips with 30 kips (5 percent) as skin friction and 630 kips (95 percent) as end bearing.

Abutment 1 Pile 2

Abutment 1 Pile 2 developed a “Case Method” pile capacity of 800 kips at a subgrade pile penetration of 14.8 feet (tip elevation +861.3 feet) and a reported pile penetration resistance of 7-8-9 blows per inch for the final three inches of pile penetration with the Delmag D19-32 operating on fuel setting 3 (rated 10.0 foot ram stroke) and providing an 8.9 foot ram stroke. Subsequent CAPWAP analyses performed on the dynamic test data from the end of initial drive indicated an ultimate pile capacity of 740 kips with 40 kips (5 percent) as skin friction and 700 kips (95 percent) as end bearing.

DISCUSSION

Based on review of the project boring logs, the piles are developing bearing in the weathered broken rock and cobble stratum overlaying the bedrock. The dynamic pile test data indicates that the tested piles developed the required ultimate “Case Method” pile capacity with measured driving stresses approaching the allowable limits for Grade 50 steel. However the tests piles did not develop the specified minimum pile tip elevation of +856.0. We understand that the Engineer is reviewing the specified pile penetration requirements and the attached dynamic pile test results to determine a driving criterion.

Please note that restrike testing to evaluate time dependent pile capacity was not performed on this test pile.



LIMITATIONS

This report has been prepared for specific application to the Barnard ER BRF 0241(39) Bridge project in Barnard, Vermont in accordance with generally accepted soil and foundation practice. The static resistance values computed with the "Case Method" and from CAPWAP analysis are estimates of the mobilized, axial compressive soil resistance at the time of testing. These soil resistance results are ultimate resistance values and they must be reduced by an appropriate factor of safety or factored compressive loading. Piles demonstrating driving characteristics different from the tested pile may require additional testing to confirm the developed pile capacity. Services not provided on this project by GZA (such as logging pile resistance (blow counts during driving)) are reported herein only as it applies to the pile testing accomplished. No other warranty, expressed or implied, is made.

If you have any further questions, please contact either of the undersigned.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

A handwritten signature in blue ink, appearing to read "Rayan".

Rayan Shamas
Geotechnical Engineer

A handwritten signature in blue ink, appearing to read "Bradford W. Roberts".

Bradford W. Roberts
Consultant/Reviewer

A handwritten signature in blue ink, appearing to read "John E. Regan".

John E. Regan
Principal

Attachments: Table, PDA Field Data, CAPWAP, Pile Logs

TABLE 1

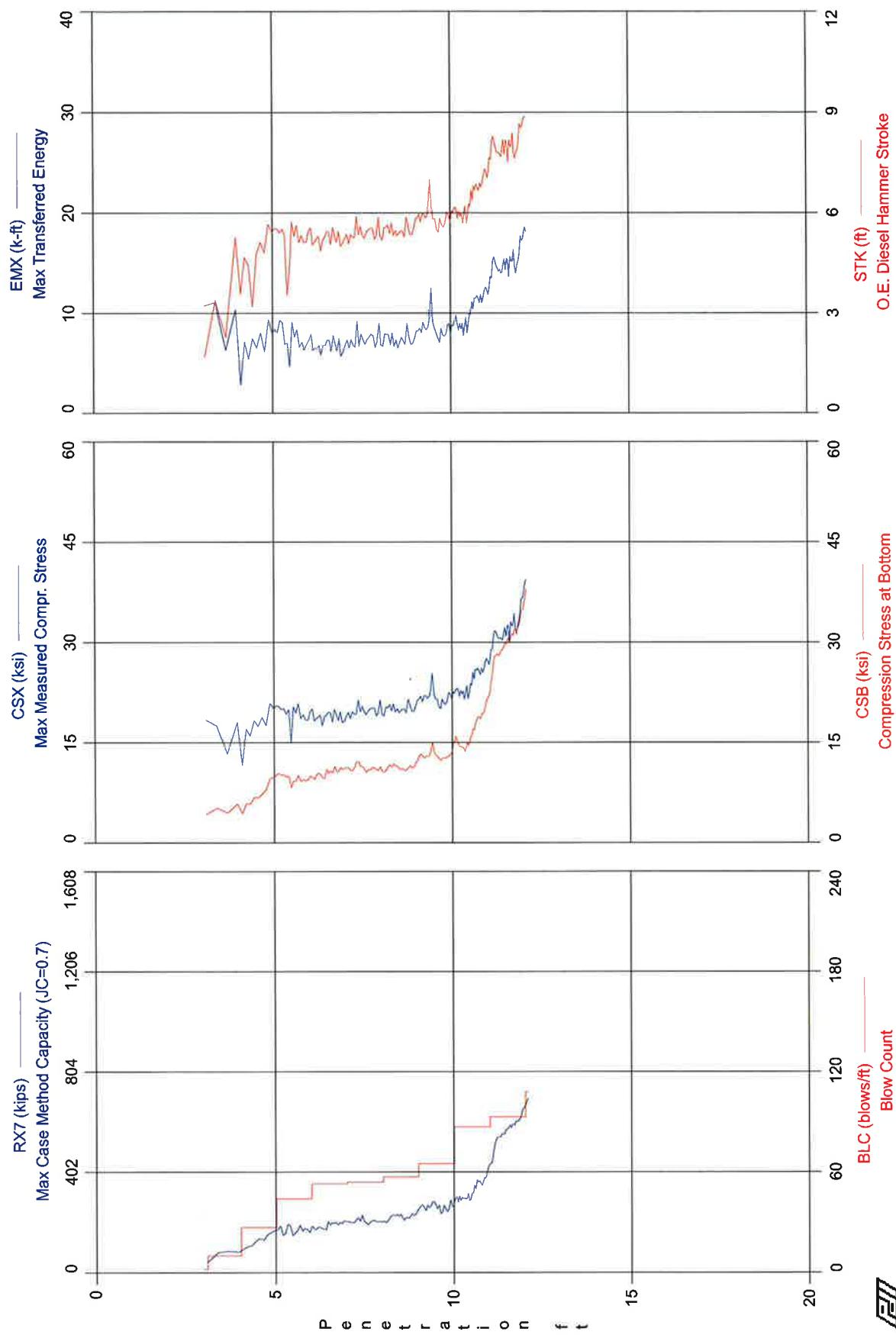
BARNARD BRF 0241(39)
DYNAMIC PILE TESTING RESULTS
BARNARD, VERMONT

STRUCTURE	PILE NO.	DATE TESTED	TEST TYPE ⁴	BLOW COUNT ³ (bpi)	PILE PENETRATION (ft)	TIP ELEVATION (ft)	HAMMER STROKE (ft)	TRANSFER ENERGY ⁵ (kip·ft)	PILE STRESS ⁶		PDA ⁷ TOTAL CAPACITY (kips)	CAPWAP ⁸		
									At Butt (ksi)	At Tip (ksi)		TOTAL CAPACITY (kips)	SKIN FRICTION (kips)	END BEARING (kips)
Abutment 1	1	6/27/14	EOD	91 bpf- 9 bpi	12.1	+ 863.9	8.8	18.1	38.7	36.9	680	660	30	630
	2	6/27/14	EOD	7-8-9 bpi	14.8	+ 861.3	8.9	17.3	31.9	39.1	800	740	40	700

Notes :

1. Test pile is HP12x74, Grade 50 steel H pile driven with an DELMAG D16-32 diesel impact hammer operating on fuel setting 3 (rated 10.0 foot ram stroke).
2. Specified nominal resistance is 402 kips based upon applying a performance factor of 0.65 to the maximum factored load of 261 kips.
3. Blow counts were reported by others.
4. Test type is defined as: EOD = end of drive.
5. Transferred Energy is the delivered hammer energy to the pile measured at the PDA sensors.
6. Pile Stress is the maximum force delivered to the pile divided by the pile area, measured at the sensor location.
7. PDA Total Capacity is the ultimate pile capacity predicted at the time of testing including skin and endbearing resistance.
8. CAPWAP Total Capacity, Skin Friction and End Bearing are derived from CAPWAP analysis and are reported as ultimate pile capacity.
9. Pile penetration is referenced to the reported top of falsework elevation of +876.0 feet.

BRIDGE 25 CROSSING LOCUST CREEK BRANFORD - ABUTMENT 1 PILE 1 (ID) - DELMAG D16-32 (HP12X74)



AR: 21.80 in² SP: 0.492 k/ft³
LE: 27.00 ft EM: 30,000 ksi
WS: 16,807.9 f/s JC: 0.50

RX7: Max Case Method Capacity (JC=0.7)
CSX: Max Measured Compr. Stress
CSB: Compression Stress at Bottom
EMX: Max Transferred Energy
STK: O.E. Diesel Hammer Stroke
FVP: Force/Velocity proportionality

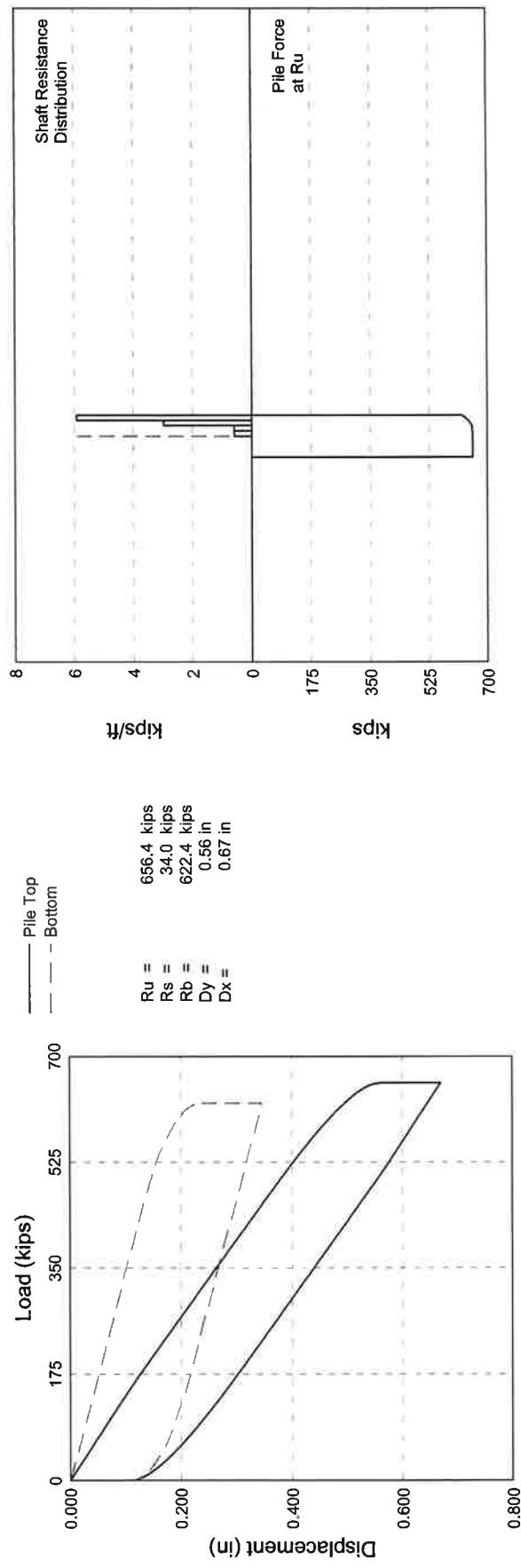
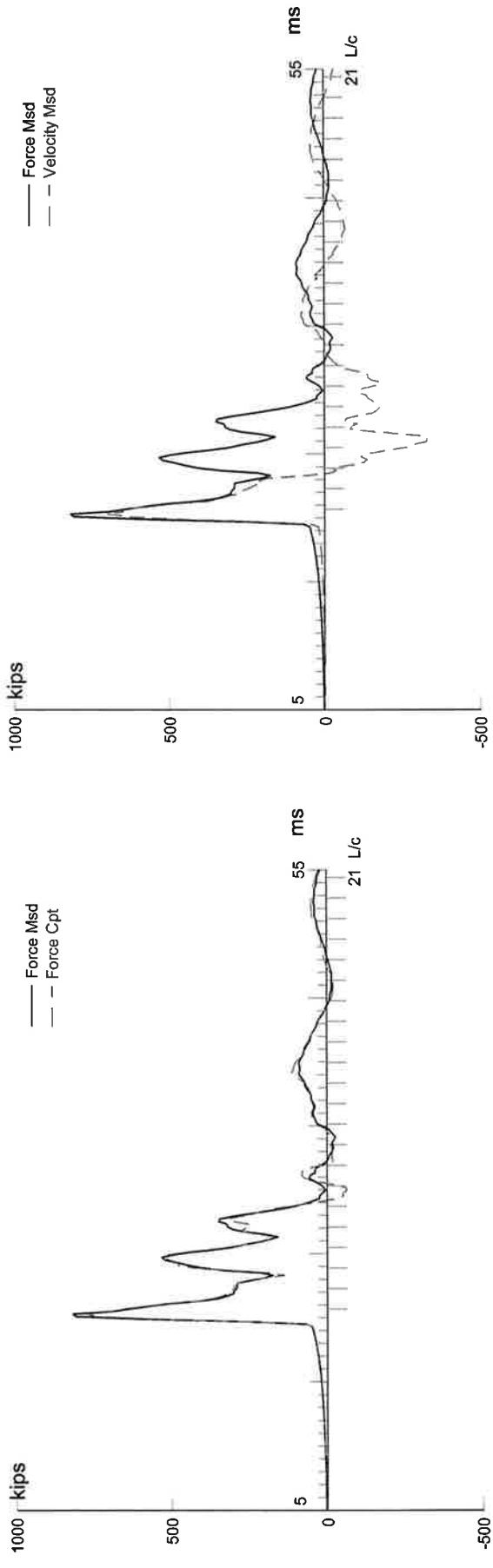
BL# end	depth ft	BLC bl/ft	TYPE	RX7 kips	CSX ksi	CSB ksi	EMX k-ft	STK ft	FVP
3	3.00	2	AV1	0	18.5	2.9	10.7	**	0.94
13	4.00	10	AV10	78	17.3	5.2	10.2	4.89	0.95
40	5.00	27	AV27	128	17.2	6.9	6.5	4.71	0.95
84	6.00	44	AV44	171	19.5	9.7	7.6	5.34	0.94
137	7.00	53	AV53	188	18.9	10.5	6.7	5.24	0.94
191	8.00	54	AV54	205	19.8	11.2	7.3	5.41	0.94
248	9.00	57	AV57	222	20.0	11.2	7.3	5.46	0.94
313	10.00	65	AV65	262	21.7	13.1	8.5	5.88	0.94
400	11.00	87	AV87	330	24.1	16.7	10.0	6.36	0.96
493	12.00	93	AV93	566	31.7	29.6	14.8	7.93	1.02
502	12.08	108	AV9	683	38.7	36.9	18.1	8.78	1.12

Time Summary

Drive 15 minutes 16 seconds 2:58:33 PM - 3:13:49 PM (6/27/2014) BN 1 - 502

BRIDGE 25 CROSSING LOCUST CREEK BRANFORD; Pile: ABUTMENT 1 PILE 1 (ID); DELMAG D16-32 (HP12X74); Blow: 499 (Test: 27-Jun-20128-Jun-2014
GZA GeoEnvironmental Inc.

CAPWAP(R) 2006-3



BRIDGE 25 CROSSING LOCUST CREEK BRANFORD; Pile: ABUTMENT 1 PILEtest: 27-Jun-2014 15:13:
 DELMAG D16-32 (HP12X74); Blow: 499 CAPWAP(R) 2006-3
 GZA GeoEnvironmental Inc. OP: RS

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity:			656.4; along Shaft	34.0; at Toe	622.4 kips			
Soil Sgmnt No.	Dist. Below Gages ft	Depth Below Grade ft	Ru in Pile kips	Force in Pile kips	Sum of Ru kips	Unit Resist. (Depth) kips/ft	Unit Resist. (Area) ksf	Smith Damping Factor s/ft
				656.4				
1	16.9	2.0	2.0	654.4	2.0	1.02	0.25	0.200
2	20.3	5.3	2.0	652.4	4.0	0.59	0.15	0.200
3	23.6	8.7	10.0	642.4	14.0	2.96	0.73	0.200
4	27.0	12.1	20.0	622.4	34.0	5.93	1.46	0.200
Avg. Shaft			8.5			2.81	0.69	0.200
Toe			622.4				604.89	0.040
Soil Model Parameters/Extensions								
Quake	(in)				0.040	0.180		
Case Damping Factor					0.175	0.640		
Unloading Quake	(% of loading quake)				30	30		
Reloading Level	(% of Ru)				100	100		
Unloading Level	(% of Ru)				60			
CAPWAP match quality	=	2.45	(Wave Up Match) ; RSA = 0					
Observed: final set	=	0.111 in;	blow count	=	108 b/ft			
Computed: final set	=	0.109 in;	blow count	=	110 b/ft			
max. Top Comp. Stress	=	35.7 ksi	(T= 20.7 ms, max= 1.097 x Top)					
max. Comp. Stress	=	39.2 ksi	(Z= 27.0 ft, T= 22.5 ms)					
max. Tens. Stress	=	-3.76 ksi	(Z= 16.9 ft, T= 31.5 ms)					
max. Energy (EMX)	=	19.2 kip-ft;	max. Measured Top Displ. (DMX)= 0.47 in					

BRIDGE 25 CROSSING LOCUST CREEK BRANFORD; File: ABUTMENT 1 PILETest: 27-Jun-2014 15:13:
 DELMAG D16-32 (HP12X74); Blow: 499
 GZA GeoEnvironmental Inc.

CAPWAP(R) 2006-3
 OP: RS

EXTREMA TABLE

Pile Sgmnt No.	Dist. Below Gages ft	max. Force kips	min. Force kips	max. Comp. Stress ksi	max. Tens. Stress ksi	max. Trnsfd. Energy kip-ft	max. Veloc. ft/s	max. Displ. in
1	3.4	778.6	-65.1	35.7	-2.98	19.22	19.1	0.464
2	6.8	779.8	-63.3	35.8	-2.90	18.87	19.1	0.441
3	10.1	781.2	-49.5	35.8	-2.27	18.27	19.0	0.413
4	13.5	785.3	-79.4	36.0	-3.64	17.59	18.9	0.381
5	16.9	791.3	-81.9	36.3	-3.76	16.77	18.7	0.346
6	20.3	794.8	-80.4	36.5	-3.69	15.67	18.4	0.310
7	23.6	749.4	-78.6	34.4	-3.60	14.49	19.3	0.272
8	27.0	854.5	-68.8	39.2	-3.16	13.06	17.5	0.232
Absolute	27.0			39.2			(T = 22.5 ms)	
	16.9				-3.76		(T = 31.5 ms)	

CASE METHOD

J =	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
RP	901.3	829.5	757.6	685.8	614.0	542.2	470.3	398.5	326.7	254.9
RX	901.3	837.4	791.5	768.4	745.4	722.4	699.3	688.4	688.4	688.4
RU	901.3	829.5	757.6	685.8	614.0	542.2	470.3	398.5	326.7	254.9

RAU = 688.4 (kips); RA2 = 697.9 (kips)

Current CAPWAP Ru = 656.4 (kips); Corresponding J(RP)= 0.34; matches RX9 within 5%

VMX ft/s	TVP ms	VT1*Z kips	FT1 kips	FMX kips	DMX in	DFN in	SET in	EMX kip-ft	QUS kips
19.15	20.88	745.1	874.5	874.5	0.468	0.111	0.111	19.5	807.9

PILE PROFILE AND PILE MODEL

Depth ft	Area in ²	E-Modulus ksi	Spec. Weight lb/ft ³	Perim. ft
0.00	21.80	29992.2	492.000	4.058
27.00	21.80	29992.2	492.000	4.058

Toe Area 1.029 ft²

Top Segment Length 3.38 ft, Top Impedance 38.91 kips/ft/s

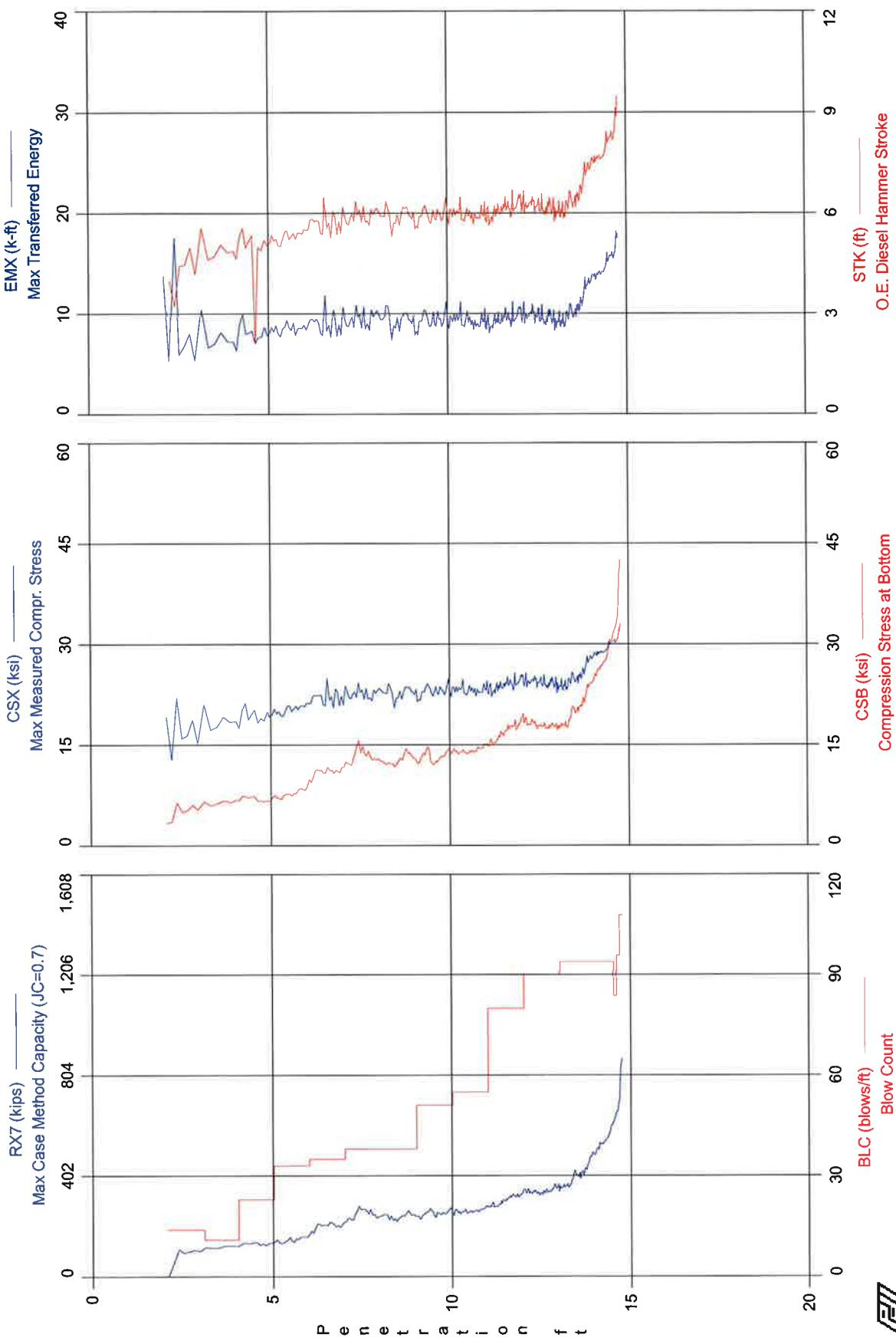
Pile Damping 1.0 %, Time Incr 0.201 ms, Wave Speed 16807.9 ft/s, 2L/c 3.2 ms

PDI PLOT Ver. 2014.1 - Printed: 28-Jun-2014

Test date: 27-Jun-2014

GZA GeoEnvironmental Inc. - Case Method & ICAP® Results

BRIDGE 25 CROSSING LOCUST CREEK BRANFORD - ABUTMENT 1 PILE 2 (ID) - DELMAG D16-32 (HP12X74)



AR: 21.80 in²
LE: 27.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft³
EM: 30,000 ksi
JC: 0.50

RX7: Max Case Method Capacity (JC=0.7)
CSX: Max Measured Compr. Stress
CSB: Compression Stress at Bottom

EMX: Max Transferred Energy
STK: O.E. Diesel Hammer Stroke
FVP: Force/Velocity proportionality

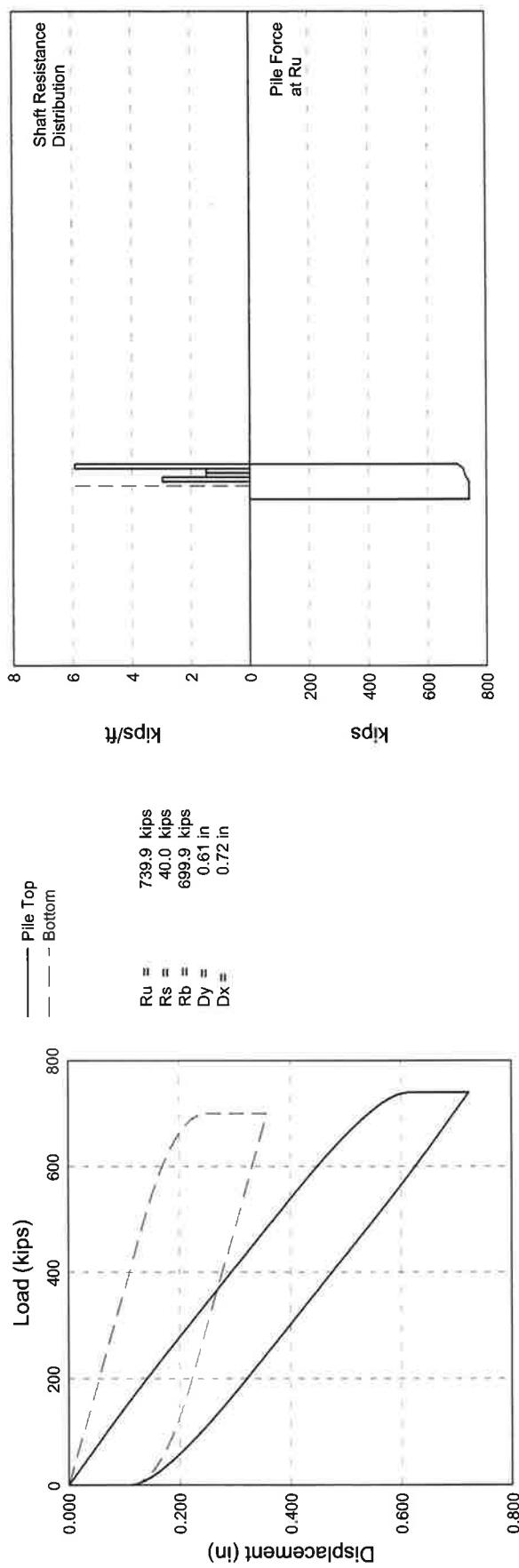
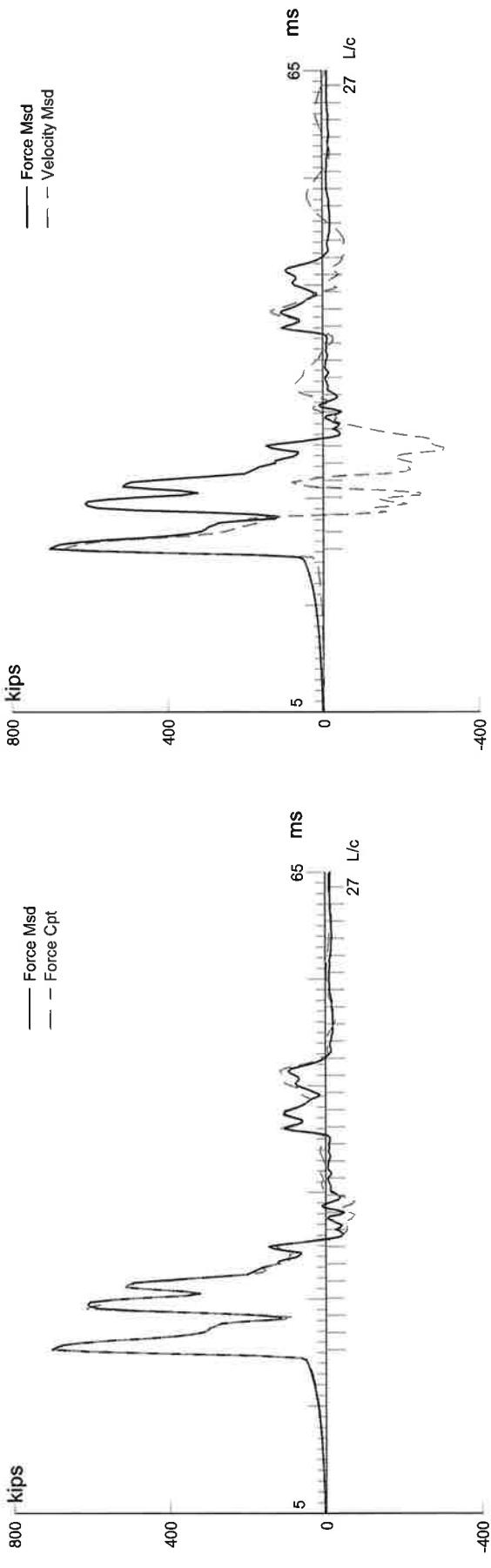
BL# end	depth ft	BLC bl/ft	TYPE	RX7 kips	CSX ksi	CSB ksi	EMX k-ft	STK ft	FVP
15	3.00	14	AV14	80	17.2	5.0	9.0	4.60	0.98
26	4.00	11	AV11	118	18.7	6.4	7.9	4.95	0.99
49	5.00	23	AV23	131	19.3	6.9	8.0	5.06	0.99
82	6.00	33	AV33	147	20.3	7.8	8.5	5.27	0.99
117	7.00	35	AV35	202	22.0	10.9	9.0	5.67	0.98
155	8.00	38	AV38	248	22.6	13.3	9.4	5.89	0.98
193	9.00	38	AV38	241	22.8	12.8	9.5	5.93	0.98
244	10.00	51	AV51	252	23.0	13.2	9.4	5.91	0.98
299	11.00	55	AV55	262	23.2	14.2	9.3	5.97	0.98
379	12.00	80	AV80	305	23.8	16.7	9.5	6.10	0.98
469	13.00	90	AV90	341	24.4	18.0	9.8	6.22	0.98
563	14.00	94	AV94	408	25.3	20.4	10.6	6.51	0.98
610	14.50	94	AV47	545	29.0	27.1	14.2	7.72	0.97
617	14.58	84	AV7	631	30.4	31.4	15.7	8.26	0.97
625	14.67	96	AV8	669	30.5	33.0	15.8	8.31	0.97
634	14.75	108	AV9	804	31.9	39.1	17.3	8.88	0.97

Time Summary

Drive 15 minutes 50 seconds

4:02:54 PM - 4:18:44 PM (6/27/2014) BN 1 - 635

BRIDGE 25 CROSSING LOCUST CREEK BRANFORD; Pile: ABUTMENT 1 PILE 2 (ID); DELMAG D16-32 (HP12X74); Blow: 634 (Test: 27-Jun-2014-28-Jun-2014)
 GZA GeoEnvironmental Inc.



BRIDGE 25 CROSSING LOCUST CREEK BRANFORD; Pile: ABUTMENT 1 PILETest: 27-Jun-2014 16:18:
 DELMAG D16-32 (HP12X74); Blow: 634 CAPWAP(R) 2006-3
 GZA GeoEnvironmental Inc. OP: RS

CAPWAP SUMMARY RESULTS								
Total CAPWAP Capacity:			739.9; along Shaft		40.0; at Toe		699.9 kips	
Soil Sgmnt No.	Dist. Below Gages ft	Depth Below Grade ft	Ru kips	Force in Pile kips	Sum of Ru kips	Unit Resist. (Depth) kips/ft	Unit Resist. (Area) ksf	Smith Damping Factor s/ft
				739.9				
1	16.9	4.6	10.0	729.9	10.0	2.16	0.53	0.151
2	20.3	8.0	5.0	724.9	15.0	1.48	0.37	0.151
3	23.6	11.4	5.0	719.9	20.0	1.48	0.37	0.151
4	27.0	14.8	20.0	699.9	40.0	5.93	1.46	0.151
Avg. Shaft			10.0			2.71	0.67	0.151
Toe			699.9				680.21	0.120
Soil Model Parameters/Extensions								
Quake	(in)				0.052	0.190		
Case Damping Factor					0.156	2.156		
Damping Type						Smith		
Unloading Quake	(% of loading quake)			70	40			
Reloading Level	(% of Ru)			100	100			
Resistance Gap (included in Toe Quake)	(in)				0.000			
Soil Plug Weight	(kips)				0.05			
CAPWAP match quality	=	3.11	(Wave Up Match) ; RSA = 0					
Observed: final set	=	0.111 in;	blow count = 108 b/ft					
Computed: final set	=	0.072 in;	blow count = 167 b/ft					
max. Top Comp. Stress	=	32.2 ksi	(T= 20.7 ms, max= 1.372 x Top)					
max. Comp. Stress	=	44.2 ksi	(Z= 27.0 ft, T= 22.7 ms)					
max. Tens. Stress	=	-8.55 ksi	(Z= 16.9 ft, T= 31.9 ms)					
max. Energy (EMX)	=	17.3 kip-ft;	max. Measured Top Displ. (DMX)= 0.44 in					

BRIDGE 25 CROSSING LOCUST CREEK BRANFORD; Pile: ABUTMENT 1 PILETest: 27-Jun-2014 16:18:
 DELMAG D16-32 (HP12X74); Blow: 634
 GZA GeoEnvironmental Inc.

CAPWAP(R) 2006-3
 OP: RS

EXTREMA TABLE

Pile Sgmnt	Dist. Below Gages	max. Force	min. Force	max. Comp. Stress	max. Tens. Stress	max. Trnsfd. Energy	max. Veloc.	max. Displ.
No.	ft	kips	kips	ksi	ksi	kip-ft	ft/s	in
1	3.4	703.0	-89.7	32.2	-4.11	17.28	17.2	0.440
2	6.8	703.7	-120.2	32.3	-5.51	16.96	17.1	0.419
3	10.1	704.7	-140.4	32.3	-6.44	16.40	17.1	0.392
4	13.5	712.4	-171.7	32.7	-7.87	15.74	16.8	0.360
5	16.9	724.8	-186.5	33.2	-8.55	14.92	16.4	0.324
6	20.3	706.8	-164.0	32.4	-7.52	13.01	18.0	0.284
7	23.6	864.8	-174.9	39.7	-8.02	11.21	18.7	0.237
8	27.0	964.4	-174.6	44.2	-8.01	9.99	15.7	0.190
Absolute		27.0		44.2			(T = 22.7 ms)	
		16.9			-8.55		(T = 31.9 ms)	

CASE METHOD

J =	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
RP	803.2	743.1	683.0	622.9	562.8	502.8	442.7	382.6	322.5	262.4
RX	970.6	938.7	916.4	895.9	878.5	869.9	861.4	855.6	850.1	844.7
RU	803.2	743.1	683.0	622.9	562.8	502.8	442.7	382.6	322.5	262.4

RAU = 810.8 (kips); RA2 = 866.2 (kips)

Current CAPWAP Ru = 739.9 (kips); Corresponding J(RP)= 0.11;

RMX requires higher damping; see PDA-W

VMX ft/s	TVP ms	VT1*Z kips	FT1 kips	FMX kips	DMX in	DFN in	SET in	EMX kip-ft	QUS kips
17.56	20.48	683.2	720.9	720.9	0.441	0.111	0.111	17.5	762.5

PILE PROFILE AND PILE MODEL

Depth ft	Area in ²	E-Modulus ksi	Spec. Weight lb/ft ³	Perim. ft
0.00	21.80	29992.2	492.000	4.058
27.00	21.80	29992.2	492.000	4.058
Toe Area	1.029	ft ²		
Top Segment Length	3.38 ft, Top Impedance	38.91 kips/ft/s		
Pile Damping	1.0 %, Time Incr	0.201 ms, Wave Speed	16807.9 ft/s, 2L/c	3.2 ms

VERMONT AGENCY OF TRANSPORTATION PILE DRIVING RECORD

Project Name & Number:

B42-1927 ER B26 02-11391

Date: 10/10/10

Abutment #: _____ Pile #: _____ Driving Criteria: _____ BPI for 3 consecutive inches with a 55 foot stroke.

Pile Type/Size: 140 2 x 34

Est. Length: _____

Driving Criteria: 11 BPI for 3 consecutive inches with a .85 foot stroke.

Elevation: Ground: 673 ft

Rile Tip Show 1-21-2001

Capacity: 400 kips

Balter: ✓✓✓

THE INFLUENCE OF CULTURE ON LANGUAGE LEARNING

— 12 —

Journal of Oral Rehabilitation 2003 30: 103–109

General Contractor:

VTrans Personnel

600

Page: 1

Foreman:

Spliced at

| Spliced at

Spliced at

NOTES FINISHED AT 12'-1" ESTABLISHED NOMINAL AXIAL RESISTANCE
OF 402 k

VERMONT AGENCY OF TRANSPORTATION PILE DRIVING RECORD

Project Name & Number:		<u>BABYARD ER BRF 0291(34)</u>		Date: <u>6/27/14</u>								
Abutment #:	<u>1</u>	Pile #:	<u>2</u>	Driving Criteria:	<u>11</u> BPI for 3 consecutive inches with a <u>8.5</u> foot stroke.							
Pile Type/Size:	<u>H P 12 x 74</u>		Est. Length:	Capacity: <u>402</u> kips Batter: <u>—</u>								
Elevations:	Ground: <u>874</u>	Pile Tip Elev:	<u>FC BEARING</u>	Cutoff Elev:	<u>878</u>							
Hammer Type/Size:	<u>DELMAR D16-32</u>		Fuel Setting:	<u>3</u>	Hammer Serial # <u>111</u>							
General Contractor:	<u>MILLER CONTRACTING</u>		VTrans Personnel:	<u>CLIFFORD</u>								
Foreman:												
Depth	Blows	Stroke, ft	Depth	Blows	Stroke, ft	Depth	Blows	Stroke, ft	Depth	Blows	Stroke, ft	
In or ft	In or ft	BPM	In or ft	In or ft	BPM	In or ft	In or ft	BPM	In or ft	In or ft	BPM	
4ft	23	4.7ft	11"	7		4"	6					
5ft	24	5.1ft	12'	7		5"	6					
6ft	33	6.3ft	1"	6		6"	6		7.6ft			
7ft	46	5.7ft	2"	7		7"	6					
8ft	38	5.7ft	3"	9		8"	5					
9ft	56	5.0ft	4"	8		9"	6					
10'	3		5"	8		10"	6					
1"	5		6"	7	6.12ft	11"	6					
2"	3		7"	6		15'	5					
3"	4		8"	7		1"	6					
4"	4		9"	7		2"	7					
5"	5		10"	9		3"	6					
6"	4	5.8ft	11"	5		4"	9		840K,AS			
7"	4		13'	5								
8"	4		1"	7								
9"	4		2"	7								
10"	5		3"	6								
11"	7		4"	8								
11'	51		5"	6	6.3ft							
1"	4		6"	5								
2"	6		7"	6								
3"	7		8"	4								
4"	6	6ft	9"	6								
5"	7		10"	7								
6"	6		11"	6								
7"	6		12"	6								
8"	6		13"	6								
9"	7		14"	5								
10"	8		15"	5								
Spliced at			Spliced at			Spliced at						
NOTES 6 BPI 3 consecutive - INCHES			8.5' stroke			40 Blows Before 14'						
									CAPACITY MET			